



MATH SL 1 FINAL EXAM

So, what do I need to know on the final exam? EVERYTHING!

Here are some hints to assist you in studying for your final exam:

1. Final exam will be worth approximately 20% of your grade.
2. You will be allowed to use a GDC on three of the questions – just show COMPLETE work for each problem!
3. You will be allowed to use your IB Information Booklet.
4. The exam will be 2 hours long and will consist of 12 questions.

Topics to study:

1. Sequences and Series (Unit 8)
 - a. Arithmetic (Finite only)
 - b. Geometric (Infinite and Finite)
 - c. Binomial Theorem (number of terms in expansion and finding specific terms)
2. Trigonometry (Units 4-6)
 - a. Law of Cosines and Law of Sines
 - b. Area of a triangle (not $\frac{1}{2}$ base * height)
 - c. Basic Trig Equations (SohCahToa)
 - d. Double Angle Identities
3. Matrices (Unit 7)
 - a. Inverse matrices (using GDC and not using GDC)
 - b. Solving systems with matrices ($AX=B \rightarrow X = A^{-1}B$)
4. Logarithms (Unit 3)
 - a. Basic Log Properties (product, quotient, power rules)
 - b. Solving equations using ln
5. Functions (Units 1-2)
 - a. Finding inverse equations of functions
 - b. Compositions of functions
 - c. Using correct notation!
 - d. Transformations of functions (shifty rules) and sketching new functions
 - e. Factoring complicated quadratics and solving using zero product property
 - f. Equations of quadratics in various forms (factored form, standard form, vertex form)
 - g. Sketching rationals, finding intercepts of rationals, finding asymptotes of rationals
6. Vectors (all in 3-dim)
 - a. Position vectors
 - b. Equations of vector lines given two points
 - c. Point of intersection of two vectors
 - d. Direction vectors
 - e. Calculating angle between two vector lines

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. In particular, solutions found from a graphic display calculator should be supported by suitable working, e.g. if graphs are used to find a solution, you should sketch these as part of your answer. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working. Working may be continued below the lines, if necessary.

1. The population of a city at the end of 1972 was 250 000. The population increases by 1.3 % per year.

(a) Write down the population at the end of 1973.

(b) Find the population at the end of 2002.

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2. One of the terms of the expansion of $(x+2y)^{10}$ is ax^8y^2 . Find the value of a .

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3. Let $f(x) = \sqrt{x+4}$, $x \geq -4$ and $g(x) = x^2$, $x \in \mathbb{R}$.

(a) Find $(g \circ f)(3)$.

(b) Find $f^{-1}(x)$.

(c) Write down the domain of f^{-1} .

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7. Let $A = \begin{pmatrix} 1 & x & -1 \\ 3 & 1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 3 \\ x \\ 2 \end{pmatrix}$.

(a) Find AB .

(b) The matrix $C = \begin{pmatrix} 20 \\ 28 \end{pmatrix}$ and $2AB = C$. Find the value of x .

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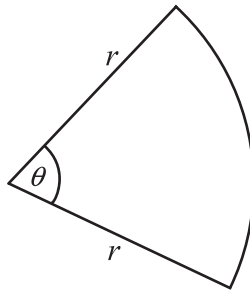
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11. The following diagram shows a sector of a circle of radius r cm, and angle θ at the centre. The perimeter of the sector is 20 cm.



(a) Show that $\theta = \frac{20 - 2r}{r}$.

- (b) The area of the sector is 25 cm^2 . Find the value of r .

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12. Consider two different quadratic functions of the form $f(x) = 4x^2 - qx + 25$. The graph of each function has its vertex on the x -axis.

- (a) Find both values of q .
- (b) For the greater value of q , solve $f(x) = 0$.
- (c) Find the coordinates of the point of intersection of the two graphs.

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13. Let $f(x) = \ln(x+2)$, $x > -2$ and $g(x) = e^{(x-4)}$, $x > 0$.

(a) Write down the x -intercept of the graph of f .

(b) (i) Write down $f(-1.999)$.

(ii) Find the range of f .

(c) Find the coordinates of the point of intersection of the graphs of f and g .

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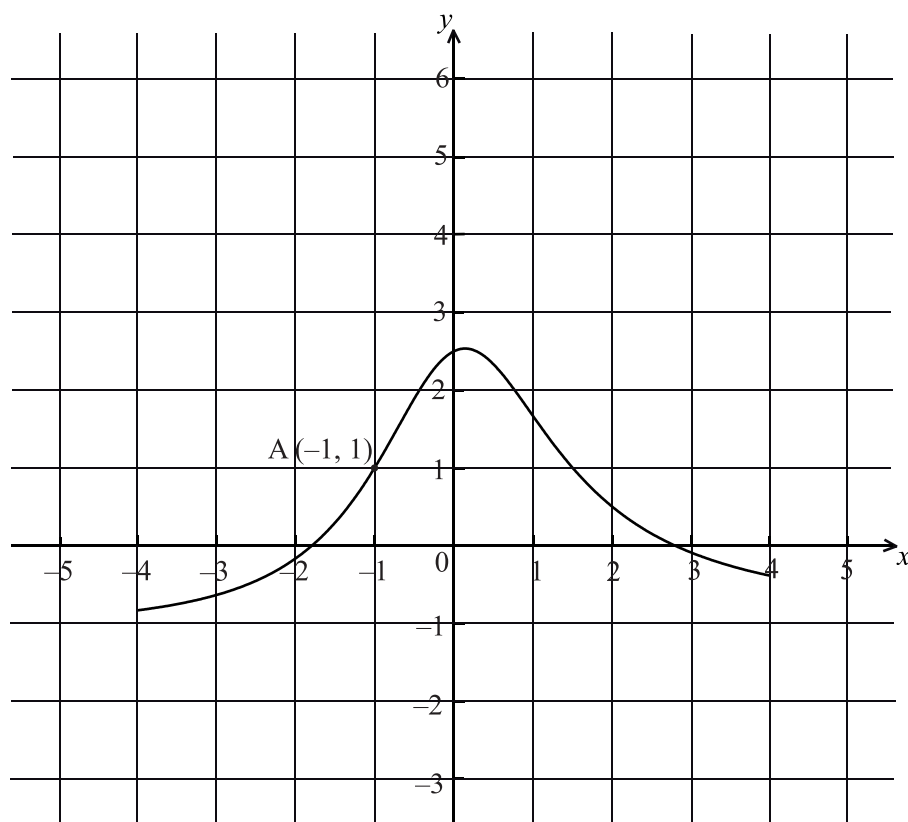
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14. The graph of a function f is shown in the diagram below. The point $A(-1, 1)$ is on the graph, and $y = -1$ is a horizontal asymptote.



- (a) Let $g(x) = f(x-1) + 2$. On the diagram, sketch the graph of g .
- (b) Write down the equation of the horizontal asymptote of g .
- (c) Let A' be the point on the graph of g corresponding to point A . Write down the coordinates of A' .

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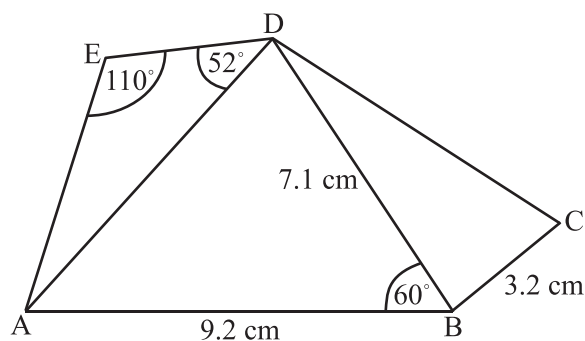
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1. [Maximum mark: 21]

The following diagram shows a pentagon ABCDE, with $AB = 9.2$ cm, $BC = 3.2$ cm, $BD = 7.1$ cm, $\hat{AED} = 110^\circ$, $\hat{ADE} = 52^\circ$ and $\hat{ABD} = 60^\circ$.



- (a) Find AD. [4 marks]
- (b) Find DE. [4 marks]
- (c) The area of triangle BCD is 5.68 cm^2 . Find \hat{DBC} . [4 marks]
- (d) Find AC. [4 marks]
- (e) Find the area of quadrilateral ABCD. [5 marks]

3. [Maximum mark: 17]

In this question, distance is in metres, time is in minutes.

Two model airplanes are each flying in a straight line.

At 13:00 the first model airplane is at the point $(3, 2, 7)$. Its position vector after

$$t \text{ minutes is given by } \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ 2 \\ 7 \end{pmatrix} + t \begin{pmatrix} 3 \\ 4 \\ 10 \end{pmatrix}.$$

(a) Find the speed of the model airplane.

[2 marks]

At 13:00 the second model airplane is at the point $(-5, 10, 23)$. After two minutes, it is at the point $(3, 16, 39)$.

(b) Show that its position vector after t minutes is given by $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -5 \\ 10 \\ 23 \end{pmatrix} + t \begin{pmatrix} 4 \\ 3 \\ 8 \end{pmatrix}.$

[3 marks]

(c) The airplanes meet at point Q.

(i) At what time do the airplanes meet?

(ii) Find the position of Q.

[6 marks]

(d) Find the angle θ between the paths of the two airplanes.

[6 marks]